Working Paper 64

FARM PRODUCTION AND MANAGEMENT OF IRRIGATION POTENTIAL

B. K. BAJPAI
D. K. BAJPAI

GIRI INSTITUTE OF DEVELOPMENT STUDIES
B-42, NIRALA NAGAR, LUCKNOW 226007

PUBLICATIONS

I BOOKS AND PROJECT REPORTS

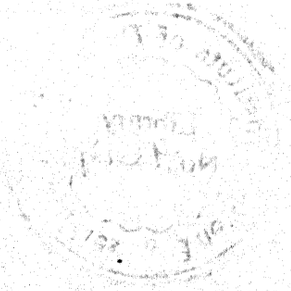
1. **T.S. Papola, V.N. Misra, H.S. Verma, R.C. Sinha and A. Joshi :** Studies on Development of Uttar Pradesh, GIDS, 1979 (Distributed by Universal Book Distributing Co., Lucknow)
2. **T.S. Papola :** Small Scale Industries in Uttar Pradesh (Mimeographed Report, 1978)
3. **:** Spatial Diversification in Manufacturing Activity (Mimeographed Report, 1978)
4. **T.S. Papola, R.S. Mathur :** Inter-Sectoral Linkages in Metal Engineering Industry in Kanpur (Mimeographed Report. 1979). Also brought out as a Working Paper (WEP 2-22/WP) by ILO, Geneva, December 1979.
5. **H.S. Verma :** Impact of Family Structure on Management of Enterprises (Ph. D. Thesis, 1979)
6. **T.S. Papola, V.N. Mishra :** Studies in Rural Industrialisation : Issues, Data Requirements and Analysis (Mimeographed Report, 1980)
7. **T.S. Papola :** Production of Woolen Carpets in Kumaon and Garhwal (Mimeographed Report, 1980)
8. **:** Impact of Concessional Finance on Industrial Development of Backward Areas (Report, 1980). Mimeographed by IDBI, Bombay.
9. **M.S. Ashraf :** Economics of Cloth Printing in Decentralised Sector (Mimeographed Report, 1980)
10. **:** Report of the Seminar on Development of Hill Areas (Printed Report, GIDS, 1980)
11. **:** Urban Informal Sector in Developing Economy (Published by Vikas Publishing House Pvt. Ltd. New Delhi, 1981)
12. **H.S. Verma :** Post - Independence Change in Rural India (Published by Inter-India Rublication, New Delhi, 1981)
13. **T.S. Papola :** Spatial Diversification of Industries : A Study in Uttar Pradesh (Published by Allied Publishers, New Delhi 1981)
14. **T.S. Papola, R.C. Sinha :** Income Distribution, Technology and Employment : A Study of Metal Utensils in India in the Basic Needs Framework. (Mimeographed GIDS & ILO, Geneva, 1981)
15. **:** Road Transport and Economic Development : A Study in Uttar Pradesh India. (Institute of Developing Economies, Tokyo, 1981)
16. **H.S. Varma :** Land as a Resource for Developing a New City : Rhetoric, Operationalization and Lessons From New Bombay. (Report, 1981)
17. **Radha Sinha, S.P. Sinha, G.P. Mishra & Gautam Pingle :** Implications of a Basic Needs Strategy for the Edible Oil Industry (Brought out as ILO Report No. WEP 2-22/WP. 84, Geneva, July 1981)
18. **T.S. Papola :** Rural Industrialisation : Approaches and Prospects. (Himalaya Publishing House, Bombay, 1982)
19. **T.S. Papola, R.T. Tewari :** Impact of Concessional Finance on Industrial Development of Backward Areas : A Study in Uttar Pradesh
20. **:** Greater Bombay : Logic, Class Basis and Methodology of its Growth and Expansion
21. **G.P. Mishra :** Dynamics of Rural Development in Village India (Published by Ashish Publishing House, New Delhi, 1982)
22. **H.S. Varma :** Bombay, New Bombay and Metropolitan Region : Growth Process and Planning Lessons (Report, 1982)
23. **T.S. Papola :** Women Workers in an Urban Labour Market : A Study of Segregation and Discrimination in Employment in Lucknow India (Mimeographed Report, 1982)
24. **Niranjan Pant, R.K. Varma :** Management and Participation in Irrigation Farmers' Organization in Sone Command Area, Bihar (Mimeographed Report, 1982)
25. **B.K. Joshi, R.C. Sinha :** Socio-Economic Implications of Micro-Hydro Power System in India (Mimeographed Report, 1982)
26. **B.K. Joshi :** Under Development in Hill Areas of Uttar Pradesh : A Socio-Economic Study (Mimeographed Report, 1983)
27. **H.S. Verma :** Producers' Cooperatives and Producers' Interests : The Case of Cooperatives Cane Development Unions in U.P. (Mimeographed Report, 1983)
28. **M.S. Ashraf, T.S. Papola :** Problems of Non-Enrolment, Non-Attendance and Dropouts in Schools : A Study in Uttar Pradesh (Mimeographed Report, 1983)
29. **R.C. Sinha :** Inter-Regional and Inter-District Variations in Levels and Growth of Income in Uttar Pradesh 1968-69 to 1976-77 (Mimeographed Report, 1983)
30. **R.T. Tewari :** District-Wise Pattern of Development in Uttar Pradesh (Mimeographed Report, 1983)
31. **T.S. Papala, M.S. Ashraf :** Socio-Economic Development of Schednled Castes in Uttar Pradesh (Mimeographed Report, 1983)
32. **B.K. Joshi, Hiranmay Dhar :** A Study of Land Transfer in Uttar Pradesh
33. **Niranjan Pant :** Organisation, Technology and Performance of Irrigation System in Uttar Pradesh
34. **Niranjan Pant, R.P. Rai :** Group Tubewell ; An Organisational Alternative to very Small Farmers' Irrigation in East Gangetic Plains

Working Paper 64

FARM PRODUCTION AND MANAGEMENT OF IRRIGATION POTENTIAL

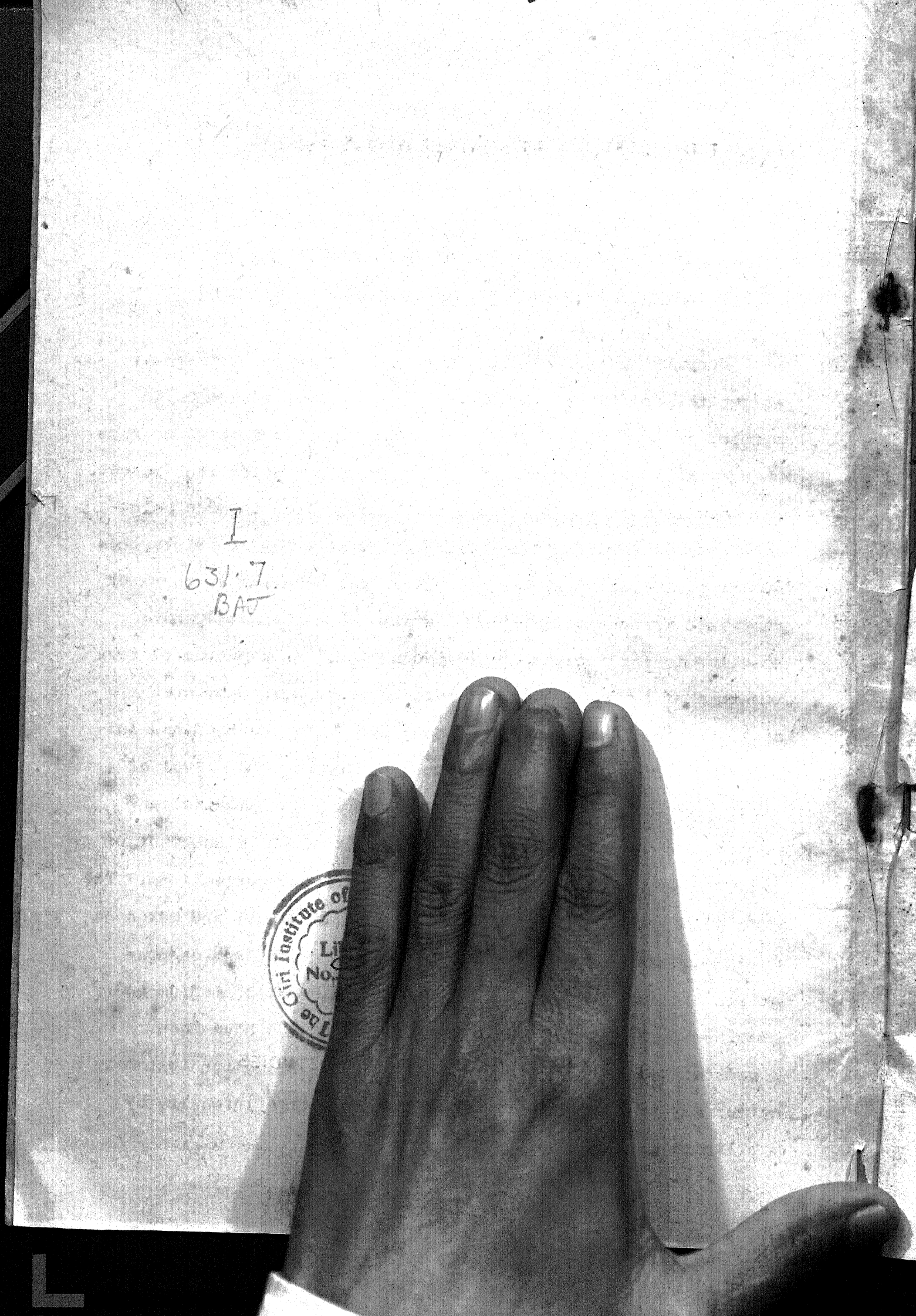
B. K. BAJPAI

D. K. BAJPAI



GIRI INSTITUTE OF DEVELOPMENT STUDIES

B-42, NIRALA NAGAR, LUCKNOW 226007



Working Paper No.64

FARM PRODUCTION AND MANAGEMENT OF IRRIGATION POTENTIAL

B.K. Bajpai
D.K. Bajpai

Despite manifold increase in expenditure of farm sector in general and towards promotion of irrigation coverage, in particular during successive Five Year Plans, the level of farm production in India, still falls short of projected requirement. Per hectare annual yield of net irrigated area is much below the expected level. Thus, irrigation system, as it exists, has not properly been utilised to derive fall benefits in terms of increased irrigation intensity, which could ultimately have resulted in far increased farm production. As a matter of fact the tune of irrigation expenditure has been marred by cost escalation of on going irrigation projects in one hand and in proper water management on the other. However the level of expenditure on irrigation is quite high (worth examining) and need not be increased in the least. Instead the management of existing irrigation requires major changes and corrections. The present paper discusses all these issues in detail and makes an endeavour to high light the causes of under utilisation/non-utilisation of irrigation potential through major, medium and small scale projects. Lastly remedial measures have been suggested to prob into the ways to run the irrigation system in a better way so as to attain increased irrigation intensity by mobilising existing potentials.

Levels of Foodgrain Output and Irrigation : An Overview.

As compared to earlier period of short production of foodgrains, India witnessed an increase of about 90 million tonnes between the years, 1950-51 and 1983-84. From the current level the food grain output is required to increase by about 80 million tonnes by the year 2000, or in about a decade and a half. The project requirement assumes new change in the current level of foodgrain intake which is far from satisfactory. The growth in output during the last three decades or the period, near about, was supported by an expansion in the area under foodgrain. The area expanded from 111 million hectares in 1955-56 to 128 million hectares in 1975-76. Thereafter, it fluctuated between 129 million hectares (1981-82) and 123 million hectares (1982-83). The foodgrains yield per hectare made an overall rise to 944 Kg. in 1975-76 from 605 Kg. in 1955-56. Thereafter, the highest yield was 1041 Kg. is 1982-83. After the mid serventies, gains in the area have slowed down. The growth in yield has tended to come down in case of kharif grain. The trend in rabi yield continues to go upwards. Though official data show the irrigated area being close to 60 million hectares as against 45 million hectares in 1975-76, the point at issue is as to how much of the land produces two crops in a year. The reckoning for 1982-83 was 26 per cent, that is, irrigation intensity was 126 per cent during the year. Only 22 per cent of the net sown area grows two crops in a year. These data go to show a good deal of unconsistency between the magnitude of irrigation undertaken and

the yield derived the average food grain production in the country in relation to the irrigated area is estimated to be 1.7 tonnes per hectare per annum, or about a third of what it should be. In any case, we have to reconcile the official data with the fact that just over 25 per cent of irrigated land gets two crops in a year. If foodgrain output is to be increased as required during the next 15 to 16 years, the nature of progress we have achieved in irrigation will have to be reviewed to identify the issues involved in its policy. For the present, it is difficult to know the precise contribution of additional irrigation to additional foodgrains output. Water management will have to be tackled on an urgent footing. The same has remained a neglected area of agricultural planning.

Development of Irrigation Potential : Targets and Achievements

Ever since the year 1951, more than Rs.16000 crores have been spent on creating over 63.6 million hectares of irrigation potential. Still thousands or crores of rupees are being spent to achieve the ultimate target of bringing 113 million hectares of land under irrigation by the year, 2000 A.D. Hence onwards, instead of making lavish investment on irrigation mainly to increase. The potential, we should also concentrate on consolidation and modernisation of the irrigation system already created for its utilisation to the maximum level so that the investment in irrigation made during the last 23 years is reflected in increased agricultural production.

The introduction of economic planning in India in the years 1950-51. broughts to light the total irrigation potential as 22.6 million hectares of land out of the total area of 132.8 million hectares under cultivation (17 per cent). It accounted for 19.9 per cent of ultimate utilisable water potential. According to the present indicators, by the year 2025 water resources are to be completely developed leading to a gross irrigation of 113.5 million hectares. By that time it is expected that the total gross agricultural sown area would rise to 210 millions hectares. Thus our ultimate target is to bring 32 per cent of the agricultural land under irrigation.[1]

The development of irrigation potential since 1951 is gives in the following table. The irrigation potential created till the end of the fifth five year plan was 56.6 million hectares. In the first three years of the Sixth Plan, new irrigation potential of 2.28 m.ha, 2.45 m.ha. and 2.35 m.ha.(estimated) was created. The original Sixth Plan target of new irrigation potential was 13.7 m.ha. But now it has been revised to reach upwards i.e. 14 m.ha. If the same is achieved, the total irrigation potential of 70.6 m.ha. would be created by the end of the year 1984-85.[2]

Table 1

Irrigation Potentials Under Major, Medium & Minor Schemes

(Million Hectares)

Year	Major and Medium Schemes	Minor Schemes	Total
1950-51	9.7	12.9	22.5
1977-78	24.8	27.3	52.1
1978-79	25.9	28.6	54.5
1979-80	26.6	30.0	56.6
1980-81	27.5	31.4	58.9
1981-82	28.5	32.9	61.4
Ultimate Potential	58.5	55.0	113.5
1984-85 (Sixth Plan Target)	5.7	8.0	14.0*

*Revised

Source : Economic Survey, 1983-84.

During the recent years, the capital cost per hectare of major/medium irrigation schemes, at constant prices (1970-71) has increased steeply from Rs.2770 in the First Plan to Rs.5880 in the Sixth Plan in the year 1979-80. According to the projections of the Sixth Plan, the cost has further risen to Rs.6969. Rise in prices during the last three years of the Sixth Plan has brought about further rise in the capital costs. Consequently, the irrigation ministry is pressing the Planning Commission to release more funds for creating the irrigation potential of almost seven million hectares during the remaining two years of the Sixth Plan.[3]

The Planning Commission has already allocated Rs.10202 crores for major, medium and minor irrigation schemes in the states. This includes Rs.8391 crores for major and medium irrigation and Rs.1811 crores for minor irrigation. Despite the massive outlay, the irrigation ministry has sought additional Rs.2600 crores on grounds of steep cost escalation in most of the ongoing projects.[4] Magnitude of cost escalation in different states can very well be emagined during different Five Year Plans considering the Table No.2.

Even after sanction of such a big financial allocation for completion of the existing irrigation projects, two contradictory points emerge therefrom, which are responsible for creating the state of flux. First, for the remaining two years of the Sixth Five Year Plan a target to create the average potential of 3.5 million hectares which means an enormous push in the programme to the tune of 48 per cent has been fixed. The same is likely to prove over expensive and unmanagable in the present cercumstances. Second, despite fixing of the priorities by the Government, being technically and financially viable towards completion of the targeted irrigation potential, there exists a wide gap between the targets and achievements. While the 22 states had achieved a potential of 4475290 hectares against the targeted 13675000 hectares. he Union Territories could achieve only 5000 hectares against the target of 66000 hectares. Apart from these two factors, the position has further worsened as a sequel

Table 2 *

Cost Escalation in Major and Medium Projects (Plan-wise and State-wise)

(Rs.in crores)

Name of State	Size of Project	Upto March 1974				April 1974 to March 1978			
		No. of Project	Approved Cost (Rs.)	Cost(Rs) Escalated	% of Cost Escalation	No. of Project	Approved Cost (Rs.)	Cost(Rs.) Escalated	% of Cost Escalation
0		1	2	3	4	5	6	7	8
1. Andhra Pradesh	Major	5	140.76	606.95	431.90	-	-	-	-
	Medium	-	-	-	-	16	52.58	31.87	60.59
2. Assam	Major	-	-	-	-	1	15.83	6.66	42.07
	Medium	3	3.81	3.89	102.36	9	16.27	1.98	12.11
3. Bihar	Major	-	-	-	-	7	418.45	136.43	32.60
	Medium	9	5.82	14.84	254.98	26	97.84	69.57	71.10
4. Gujarat	Major	4	74.01	171.37	231.55	2	60.31	61.78	102.43
	Medium	19	20.98	26.67	127.07	15	32.80	27.20	82.89
5. Haryana	Major	1	4.13	25.86	626.25	1	40.00	54.29	135.72
	Medium	-	-	-	-	-	-	-	-
6. Himachal Pradesh	Major	-	-	-	-	-	-	-	-
	Medium	-	-	-	-	2	5.52	2.16	39.13
7. Jammu and Kashmir	Major	1	29.84	31.77	106.46	-	-	-	-
	Medium	3	4.54	3.96	87.00	10	12.80	8.83	69.03
8. Karnataka	Major	-	-	-	-	1	90.54	7.46	8.24
	Medium	-	-	-	-	6	19.53	3.41	17.46
9. Kerala	Major	-	-	-	-	6	84.88	127.44	150.14
	Medium	-	-	-	-	-	-	-	-
10. Madhya Pradesh	Major	4	27.11	48.93	180.48	5	83.32	9.99	17.98
	Medium	1	0.47	N.E.	N.E.	48	77.46	35.79	46.19
11. Maharashtra	Major	-	-	-	-	9	344.11	352.78	102.51
	Medium	26	43.69	37.34	85.46	26	40.54	16.56	40.85

Contd./-

Table 2 Continued

Name of State	Size of Project	April 1978 Onwards				% of Escalation During 1971-1981	Total No. of Projects
		No. of Project	Approved Cost (Rs.)	Cost (Rs.) Escalated	% of Cost Escalation		
0		9	10	11	12	13	14
1. Andhra Pradesh	Major	1	22.02	N.E.	N.E.	372.86	6
	Medium	5	29.01	6.32	21.75	48.00	21
2. Assam	Major	1	15.32	1.49	9.72	26.16	2
	Medium	7	25.98	1.37	5.27	27.17	19
3. Bihar	Major	2	166.65	7.29	4.37	24.56	9
	Medium	9	45.33	1.28	2.82	58.40	44
4. Gujarat	Major	2	44.06	28.59	64.88	146.73	8
	Medium	14	68.68	14.65	21.33	71.08	48
5. Haryana	Major	-	-	-	-	181.62	2
	Medium	-	-	-	-	-	-
6. Himachal Pradesh	Major	-	-	-	-	-	-
	Medium	-	-	-	-	39.13	2
7. Jammu & Kashmir	Major	-	-	-	-	106.46	1
	Medium	4	16.03	N.E.	N.E.	45.92	17
8. Karnataka	Major	1	283.65	116.35	41.02	33.08	2
	Medium	9	31.73	4.73	14.87	11.11	15
9. Kerala	Major	1	163.57	12.42	8.00	56.29	7
	Medium	1	7.60	4.40	57.89	57.89	1
10. Madhya Pradesh	Major	6	379.64	173.32	45.65	47.38	15
	Medium	24	103.18	11.02	10.67	23.50	73
11. Maharashtra	Major	1	72.66	N.E.	N.E.	84.64	10
	Medium	17	61.45	5.11	8.31	40.71	69

Contd./-

Table 2 Continued

0		1	2	3	4	5	6	7	8
12.Manipur	Major	-	-	-	-	-	-	-	-
	Medium	1	4.62	12.24	264.93	4	12.42	5.06	40.77
13.Orissa	Major	3	46.85	1.61	3.43	3	316.65	100.04	31.59
	Medium	10	22.56	47.14	209.06	13	24.56	29.74	121.14
14.Punjab	Major	-	-	-	-	6	551.80	44.78	8.12
	Medium	-	-	-	-	2	4.30	3.01	69.93
15.Rajasthan	Major	2	120.48	174.71	145.01	-	-	-	-
	Medium	2	5.04	0.96	18.84	9	20.11	18.81	93.53
16.Tamil Nadu	Major	-	-	-	-	1	14.55	57.45	394.84
	Medium	1	0.99	2.77	279.79	6	9.20	0.55	5.86
17.Tripura	Major	-	-	-	-	-	-	-	-
	Medium	-	-	-	-	-	-	-	-
18.Uttar Pradesh	Major	6	88.00	352.22	400.25	7	616.05	237.38	38.53
	Medium	18	35.17	8.27	23.51	12	20.41	5.57	27.30
19.West Bengal	Major	-	-	-	-	1	69.72	80.28	115.14
	Medium	5	2.53	0.67	26.48	12	7.77	4.32	55.67
INDIA (Total)	Major	26	531.18	1413.42	266.09	50	2706.21	1275.76	47.18
	Medium	98	150.22	158.75	105.67	216	454.10	264.43	58.23

Table 2 Continued

0		9	10	11	12	13	14
12.Manipur	Major	1	47.25	6.75	14.28	14.28	1
	Medium	1	15.00	N.E.	N.E.	53.98	6
13.Orissa	Major	2	250.27	-71.48*	-28.56	4.91	8
	Medium	6	44.19	26.16	59.19	106.82	29
14.Punjab	Major	1	152.03	156.97	103.25	28.66	7
	Medium	-	-	-	-	69.93	2
15.Rajas-than	Major	-	-	-	-	145.01	2
	Medium	5	22.28	7.17	32.19	76.44	16
16.Tamil Nadu	Major	-	-	-	-	394.84	1
	Medium	1	3.66	-0.39*	-	39.47	8
17.Tripura	Major	-	-	-	-	-	-
	Medium	3	21.16	5.93	28.02	28.02	3
18.Uttar Pradesh	Major	8	284.60	328.42	115.39	92.86	21
	Medium	2	4.36	N.E.	N.E.	28.60	32
19.West Bengal	Major	2	35.27	N.E.	N.E.	76.46	3
	Medium	-	-	-	-	64.90	17
INDIA (Total)	Major	29	1916.94	760.15	39.65	66.94	105
	Medium	108	499.64	87.75	17.56	48.94	422

*The table is reproduced from Major and Medium Irrigation Projects : An Analysis of Cost Escalation and delay in completion - Dr.Niranjan Pant. Working Paper No.41, GIDS Lucknow

of continuous increase in losses of on-going irrigation projects. In the begining of the year 1980-81 these losses accounted for Rs.325 crores which increased to a little more than Rs.400 crores during the year 1983-84.

Utilisation of Created Potential :

More disgusting feature about Indian irrigation is that with the growing direct losses, there is an increasing tendency also in indirect losses being incurred on account of under utilisation of created irrigation potential. In the initial stages, during 1951, the created irrigation potential used to be fully utilised and there was no gap between created potential and utilisation. Gradually in the successive years, the utilisation process began to fall behind the created potential. Presently the gap stands at 4.8 million hectares. Even if the cost estimates prepared in 1980 are accepted, Rs.800 crores, as enviseged, are needed to create an irrigation potential of one million hectare. Thus, up to June 1983, when irrigation potential of 4.8 million hectare was lying idle, the anormous of about Rs.3840 crores was lost due to non-utilisation of irrigation potential.[5] In most of the canal systems the water losses in transit from the head of the system to the field are of the order of 70 to 80 per cent.[6] Conveyance losses in the canal system are very high, and it was estimated in 1960 that over 6 million hectares of additional land could be irrigated by lining the canal systems. The level of under-utilisation can be measured by a simple calculation : if losses could be reduced by 10 per cent, the savings would amount

to very roughly 20 million acre-feet, which is equivalent to about three additional Bhakra dams.[7] A UNDP study showed that in India there is as much as 25 per cent loss of water in the canal system, 22.5 per cent in the water sources and 21.5 per cent in the fields, amounting to total loss of 69 per cent. The cumulative loss will be much higher if the loss on account of siltation and weed growth in canal is taken in to account. Loss of agricultural production due to non-utilisation of irrigation potential can very well be imagined in light of the recent import of food grains. The problem of non-utilisation is further aggrevated with presence of phenomenon that the states like Punjab, Haryana and West Bengal having high levels of irrigation potential are utilising higher percentage of created potential where as the states with low or limited irrigation potential have gone far behind the percentage of utilisation of their irrigation potential. The following table indicates the irrigation potential and its utilisation to end of 1950-51, 1960-61, 1968-69, 1977-78, 1979-80 and 1981-82 respectively.

Table 3

Irrigation Potential and its Utilisation (M.Ha.)

Period	Major & Medium			Minor Irrigation			Total Irrigation		
	Poten-tial	Utili-sation	%	Poten-tial	Utili-sation	%	Poten-tial	Utilisa-tion	%
1950-51	9.70	9.70	100.00	12.9	12.9	100.00	22.6	22.6	100.00
1960-61	14.40	13.10	90.97	14.8	14.8	100.00	29.2	27.9	95.55
1968-69	18.50	16.90	91.35	19.0	19.0	100.00	37.5	35.9	95.73
1977-78	24.80	21.20	85.48	27.3	27.3	100.00	52.1	48.5	93.09
1979-80	26.60	22.6	84.96	30.0	30.0	100.00	56.6	52.6	92.93
1981-82	28.50	24.60	86.32	32.9	32.9	100.00	61.4	57.5	93.65

Sources : III, IV, V & VI Five Year Plan, Govt. of India, Planning Commission and Economic Survey Government of India.

At the all India level, the proportion of non-utilisation to the potential was 22 per cent between 1951 and 1979-80 in respect of major and medium irrigation projects, according to another estimate of the Economic Survey for the year 1982-83.

A number of factors can be traced out here which can be held responsible for the non-utilisation/lower utilisation of existing irrigation potential. Since the conditions of under utilisation of minor irrigation are different from the major ones, both are being dealt with seperately.

(A) Minor Irrigation

The most common source of minor irrigation in major parts of the country - the open wells - have been in use from times immemorial. Their number increased with an increase in the cultivated area. There have been significant additions to their number throughout the plans. But the new wells constructed during any period do not make an addition to the total number to the full extent, as during this period some wells go out of use. In areas where canal irrigation is introduced, some wells tend to go out of use as soon as the less expensive flow of irrigation water is made available. In many cases, the wells are restored with an increase in the cropping for which canal water may not suffice. There can be several other reasons for open wells falling into disuse. The well-sides may collapse and the damage caused may go beyond economic means of repair. The level of ground water may drop leaving the wells dry. Fragmentation of holdings served by a well may lead to diluted responsibility with

regard to its upkeep and therefore, indifference to its proper mentainence resulting in its dereliction. Disputes regarding the use of water may also lead to abandonment of a well.[8]

Four factors namely, land consolidation, rural electrification, institutional credit and use of HYV seeds are widely believed to have effected the level of use of utilisable minor irrigation resources. The regions suffering from the problem of land fragmantation and not having adequate arrangements and progress in land consolidation works are not in a position to make full use of irrigation potential on account of heavy waste of water and under utilisation of tube wells. The states of Punjab and Haryana which began land consolidation in right earnest even before 1951, completed the task of consolidation faster than those of U.P., Bihar and West Bengal.[9] The level of utilisation of major irrigation sources is far above in former states as compared to latter ones.

Since 1963 rural electrification has been promoted by the planners primarily with the intention of encouraging investments in minor irrigations, especially groundwater irrigation, for which electrically operated water-lifts tend to prove more economical than diesel driven ones, both in terms of capital and operational costs. Unfortunately, 'minor irrigation programme suffered a setback on account of shortage of EC grade alluminium slowing down the electrification programme which was most vital for the utilisation of groundwater and surface lift irrigation schemes'.[10]

Minor irrigation projects cost much less and promote rural capital formation because a part of investment is funded by the farmer's own savings. The remaining part requires autonomous investment funded by institutional credit schemes. Inadequate availability of institutional credit increeases the saving-capital gap, specially in case of poor farmers. The use of associated inputs of irrigation is restricted to the level which the farmers can afford either through their own funds or institutional sources. There has been a lower order of availability of institutional funds for minor irrigation purposes in eastern part of gangetic plain as compared to the western one. As a result of this, the farmers of east-gangetic plain have remained deprived of utilising created minor irrigation facilities to the required extent. The farmers of east gangetic plain according to B.D. Dhawan have been very disadvantagiously placed in respect of five factors, namely interest rate on short-term credit, know-how of HYV agriculture, agricultural extention services, risk taking capacity and availability of prompt repair services, as compared to the western plains. While high interest rate on short term credit tends to force a farmer to use less associated inputs of irrigation, and concequently realise less benefits from a given volume of irrigation, inadequate agricultural extension service may force him to opt for the traditional agriculture, in which cetris paribus benefits from irrigation are a small fraction of the benefits from irrigation is HYV agriculture. Further more, since HYV seeds make rather exacting demand on a farmer for timely application of water, their adoption is

contingent on both i) farmer's ability to provide prompt repair of tubewell adisorder in the event of breakdown and ii) his knowledge about the agronomy and entomology of HYV seeds.[11]

(B) Medium and Major Irrigation

Reasons behind under utilisation and misutilisation of major and medium irrigation potentials can primarily be traced in its defective management system. The major irrigation management which is governed by Command Area Development Programme, suffers from a gap in socio-economic research on canal and canal irrigated agriculture. 'In a country with a history of extensive canal irrigation going back before the begining of this century it is a remarkable and unfortunate fact that there exists, to the best of my knowledge, not a single comprehensive account of how a canal is actually administered.'[12] The slackness on this part resulted in a gap between canl irrigation potential and the actual irrigation. Further, this led to uncontrolled, untimely, uneven and unjustifiable availability of canal water which resulted in existing water seepage, logging and salinity problems on one hand and concequently is reduced farm productivity on the other.

Our canal system suffers from heavy loss of water due to the problem of seepage. 'It has been roughly estimated that a third to a half of seepage water from channels gets absorbed in the top buyers of adjoining soil and is lost through evaporation and transpiration. Of the remaining quantity that reaches the ground water table, only about 70 per cent can be drawn out locally.

The rest regenerates itself else where it may or may not be utilised. Thus only a third to a half of the seepage loss can be retrived by pumping.[13] In the existing system of lining for canals, generally clay, cement and tiles are used. Clay offers only a limited protection from the water seepage. Tiles and cement develop cracks with the passage of time, hence the current lining methods in India offer limited protection.

The practice of field to field irrigation, used in many regions of the country, leads to non-uniform distribution of water among different fields in an outlet command and also to loss of water and fertilizer. It also restficts the choice under multiple cropping system. Apart from this there is a lot of wastage in the use of water. For example, it is found that Indian farmer uses three times the quantity of water for getting the same rice crop as compared to his Japanise counterpart. The tune of wastage is encouraged on account of present system of supplying irrigation water. Water is sold on the basis of area. Farmers may take any amount of water against the per hectare payment for the same type of crop irrespective of the actual quantity of water used. This has led to over-irrigation as there is no inducement to save and economic the water usage. Farmers go on using water even after fully meeting the water requirements of the crops this has created the problem of water logging, rendering the land unproductive for ever unless reclaimed at very high costs.

Considering the nature of all the above mentioned causes regarding the under utilisation of existing irrigation potential and involvement of wastage in the usage of irrigation water, India does not need any more irrigation projects for the next two decades for producing an estimated 2.5 million tonnes of foodgrains by 2000 A.D. This can be justified by the simple calculation that our existing irrigated level of about 60 million hectares produces 1.5 tonnes of foodgrains per hectare(on an average). The remaining 115 million hectares of land, which is rainfed rpduces only half a tonne of foodgrains every year. By adding the production from both types of land the total annual foodgrains production reachest 148 million tonnes. The target of 215 million tonnes can comperatively be achieved by increasing the yield of irrigated land from 1.5 to 2.5 tonnes per hectare. Taking into account the foodgrain yield of irrigated land in developed countries (approximately six tonnes per ha.), the required increment in the yield of irrigated land does not seem to be farfetched idea. This calls for a speedier rectification of existing bottlenecks in the field of medium/major and minor irrigation system. Though the required steps have been initiated by the government, the problems, nevertheless, are to be dealt in depth. 9614.

To establish the required level of irrigation efficiency towards attaining the production target some remedial measures should be considered to cope with the aforesaid problems.

Remedial Measures

Renewal of old wells : To begin with the minor irrigation, for revival of the most common source of minor irrigation. The wells, which are out of use and obsolate, exist in substantial number in the different states. It would be desirable for the states to enquiry into the causes leading to a substantial number of wells having gone out of use and evolve remedial measures so that the investment already made on there wells are not altogether wasted. If some credit is required for restoring an abandoned well, it should be provided, as it would generally be cheaper to restore an old well than dig a new one.[14]

Consolidation of Land : In order to over come the problem of land fragmentation, besides a proper by out of water cources, field drains and farm roads, consolidation of holdings is very essential. During the process of consolidation, land can be earmarked for there and other common purposes. The planning of land development, including construction of water-cources, field drains and farm roads, should go hand in hand with consolidation of holdings.

Assured Power Supply : Rural electrification with assured supply of power is to be promoted, considering the problems in this front during preceeding years, for accelerating the minor irrigation programme as also proposed under minor irrigation development programme of Sixth Five Year Plan, there must be a close synchronisation between the rural electrification programme and the development of the lift irrigation to achieve quick

progress. Imposition of power restriction in irrigated agriculture should be avoided, as far as, possible, Efforts should be directed to increase the efficiency of the pumpsets, particularly those used by the farmers, by selection of appropriate size of motors, pumps, suction and delivery heads. Guidelines are proposed to be issued for the use of the farmers.[15]

Proper Administration of Credit Facilities : As discussed earlier, while the flow of institutional credit has not been picking up at the desired rate, specially in the states of Eastern and North-Eastern regions, the tempo has been going down in many other states due to deteriorating recovery position of the banks. Considering the problems of institutional credit, the following steps have been proposed to be taken under the Sixth Five Year Plan.[16]

i) Revitalising organisations for collection of hydrological data, quick preparation of feasible schemes and monitoring, sanction and implementation of the schemes.

ii) Simplification and streamlining of the producers for processing of loan applications.

iii) Active involvement of revenue staff, the village level workers, boring machineraes and other staff of the minor irrigation development in collection of loan applications.

iv) Giving maximum emphasis on organising local campaigns (credit meals) for clearance of a large number of application on the spot.

v) Organising drives for completion and updating of land records in the states of Eastern Regions and adopting quick procedures for certification of land title in the absence of updated records.

vi)Organising and sustaining drives for improving the recovery position of lending banks.

Only speedy adoption and proper implementation of proposed steps can bring about required changes in the prevailing credit system towards finding marked development in minor irrigation works.

Steps Against Theft and Timeliness :

With a view to provide timely irrigation water, particularly with reference to HYV cultivation, according to National Commission on Agriculture 1976, the whole field of administration and management of public tubewells and lift irrigation projects should be given special attention. Drastic administrative measures should be taken to contol the theft of transformers and conductors, more so, during the period of keen irrigation demand. Progressive young farmers should be specially trained in handling mechanical and electrical equipment in carrying out petty repairs on the spot for their pumps/tubewells. Concerned departments of the state and organisation should backup this programme.

Improved Managerial Control for Major Irrigation :

'The degree of managerial control is inversely related to the water requirements of the system, so that the greater the degree of control, the greater the area that can be supplied with a

given amount of water per acre from a given water source, or the greater the amount of water that can be applied to a given area (holding the seepage, percolation, evapotransperation and land preparation are constant). The required level of control has important implications for relationship among farmers and between farmers and irrigation personnel : broadly speaking, increased cooperation and coordination are required as a given water source is used to irrigate a lesser area.'[17] The improved managerial control can reduce the conflict between twin objectives of irrigation requirement. Such as compliance over the needs of expectant farmers, politicians and planners to increase the canal coverage in larger areas in one hand and to fulfil the water requirements of the new varities of seeds, which need more timely water than old varieties, on the other. Thus, an efficient irrigation management is required to save water and there by increase output.

Use of Plastics to Prevent Seepage :

Towards reduction in the loss of canal water from seepage, which in turn takes place on account of faulty lining methods, the PVC pipes have been found to produce better results as in developed countries. Plastic pipes require less electricity to move water to a distance. In India, some canal authorities have used low density polyethylene films with success. However, resources for a huge and potential demand of this type of plastics still remains to be tapped in India. Though this method of lining the canal is costly, it saves lot of water which may be

used for increasing agricultural production, through which the increased cost would be made good in the long run. Water loss depends on the type of soil through which the canal flows. It is 35 cubic feet per second million sq.feet of wetted area in respect of porous gravelly soil and 17 and 20 in respect of sandy loam and loose sandy soil respectively. It would be a good policy to line all canals with plastics. But to begin with at least such high seepage areas should be selected for plastic lines in all future lining programmes.

Construction of Field Channels : To get rid off the problems arising out of field to field irrigation. The Command Area Development Authorities are being given 50 per cent subsidy plus loans for construction of field channels. However, the progress of the implementation of the programme varies from state to state. The states which have lagged far behind such as, Haryana, Kerala, West Bengal, Tamil Nadu and Orissa should now make concerted efforts to mobilise additional resources for this purpose. Making maximum use of available water by wiping out the gap between irrigation potential and utilisation by constructing field channels would be only one aspect of the revised programme.

Adoption of Other Allied Methods to Boost up Irrigation Efficacy and Water Saving :

For the availability of timely and required quantity of water supply, a few command area authorities are equipped with computers and other facilities. With that they can take quick decisions and impliment than the intensive instalation of

computer system can check the problems of untimely and unaccounted water delivery. In western countries irrigation authorities do share responsibility to pay damages to the farmer in the event of the failure of the department to supply the water. Only when the farmer is assured of definite water supply or compensation for the loss sustained by him due to the failure of the irrigation department, can he take up intensive cultivation.

With a view to avoid water wastage, particularly in many scarcity prone areas, the 'drip irrigation method' must be introduced. The consumption of water has been reduced to the tune of 80 per cent with the application of this method in Israel. Utility of this technique also ensures minimum but appropriate use of water and fertilizer, reduction in fertilizer consumption and increased agricultural production. Drip irrigation system is useful for small holdings, which are predominant in India. Drip irrigation makes such small holdings viable for operation by bringing them high returns.

Another measure to check the wasteful use of irrigation water is the introduction of volumetric assessment of water use instead of existing area basis assessment. An experiment in this regard has proved that with the adopting of volumetric' assessment instead of area based, the same amount of water can irrigate 45 per cent of higher area. As an alternate to settle down this issue, along with the solution of some other allied problems, the introduction of irrigation cooperative societies,

as proposed by WTC if Indian Agricultural Research Institute, will also prove a multipurpose progressive step. All the functions like : distribution of water, maintenance of water ways, fixing the rates, recovery of water charges may be handed over to these societies. Thus, these societies would function in between irrigation department and consumers as retailer, by getting supply of canal water at wholesale prices.

References

1. Sixth Five Year Plan, 1980-85, Planning Commission and Economic Survey, 1983-84, Government of India.
2. Ibid.
3. Irrigation in India, Economic Times, Jan.25, 1984.
4. Ibid.
5. Ibid.
6. Chaturvedi, M.C.N.D.(1974), Water in Second India, Second India Studies, Ford Foundation, New Delhi.
7. Robert Wade, India's changing strategy of irrigation development; Irrigation and Agricultural Development in Asia, Edited by E. Walter Coward, Jr.; Cornell University Press, Ithaca and London, 1980.
8. Report of the National Commission on Agriculture, 1976, Part V - Resource Development, Govt.of India, Ministry of Agriculture and Irrigation, New Delhi.
9. Dhawan, B.D.; Development of Tubewell Irrigation' in India, Institute of Economic Growth, Agricole Publishing Academy, New Delhi, 1982.
10. Op Cit, Sixth Five Year Plan.
11. Op Cit, Dhawan, B.D.
12. Op Cit, Robert Wade.
13. & 14. Op Cit, Report of the National Commission on Agriculture.

15 & 16. Op Cit, Sixth Five Year Plan.

17. Op Cit, Ropert Wade.

II WORKING PAPER

1. **V.B. Singh, P.D. Shrimali & R.S. Mathur** : The Problems of Select Urban Handicrafts in Uttar Pradesh (Summary of Project Report)
2. **R. S. Mathur** : Chikan Handicraft, Lucknow
3. **V. B. Singh, R. S. Mathur** : The PIREP : An Evaluation of Reoti and Bansdih Blocks (Summary of Project Report)
4. **T. S. Papola** : Planning for Employment : Some Observations
5. : Rural Industries in U. P. : The Non-Household Sector
6. : Industrialisation, Technological Choices and Urban Labour Markets
7. : Rural Householed Industries in Uttar Pradesh
8. : Fiscal Devolution by Finance Commission : Plea for a Dynamic Approach
9. : Report of the Seminar on Regional Patterns of Agricultural Development
10. : Report of the Regional Seminar on the Indian Youth
11. **Bhanwar Singh** : The Exchange Structure and the Process of Capital Accumulation in India
12. **H. S. Verma** : Services in Urban India : A Non-elitist Perspective
13. : Family and Industrial Development in India : Some Issues and Hypotheses
14. : Character and Functioning of Rural Parties and Working of Federal Polityin India
15. : Studying Entrepreneurs and Entrepreneurship : An Examination of the Adequacy of Approaches Used
16. **R. Ramasubban** : Health Care for the People : The Empirics of the New Rural Health Scheme
17. : National Movements in Ex-Colonial Democracies : The Naga Impasse in India
18. **V. N. Misra, A. Joshi** : Performance of Agriculture in Semi-arid Region of U P. : An Inter-District Analysis
19. **T. S. Papola** : Sex Discrimination in the Urban Labour Markets : Some Propositions Based on Indian Evidence
20. **H S. Verma** : Study of Social Change in Independent Rural India Critical Issues for Analysis of Fourth Decade
21. **T. S. Papola, V. N. Misra** : Labour Supply and Wage Determination in Rural Uttar Pradesh
22. **T. S. Papola** : Informal Sector : Concept and Policy
23. **H. S. Verma** : Nature and Development Implications of Post-Independence Change in Rural India : A Case Study from Uparhar Area
24. **Shiva K. Gupta** : Harijan Legislators : Their Alienation & Activism (Harijan Power : A Case Study)
25. **B. K. Joshi** : Is Economic Growth Relevant ?
26. **Shiva K. Gupta** : Irrigation Farmers' Organisation in Uttar Pradesh
27. **Niranjan Pant** : Irrigation Farmers Organisations : A Case Study of Tarwan (Bihar)
28. **R. T. Tewari** : Application of Cluster Analysis for Identification of Planning Regions in Uttar Pradesh
29. **H. S. Verma** : The Identity Question in the Indian Industrial Families
30. **G. P. Mishra** : Agrarian Social Structure, Rural Power and Dynamics of Rural Development
31. **B. K. Joshi** : Poverty, Inequality and the Social Structure
32. **Niranjan Pant** : Management of Major Canal Systems in Bihar : A Kosi Case